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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/719,083	11/21/2003	Young Sun Hwang	30205/39513	2261

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MARSHALL, GERSTEIN & BORUN LLP
233 S. WACKER DRIVE, SUITE 6300
SEARS TOWER
CHICAGO, IL 60606

EXAMINER	
GEORGE, PATRICIA ANN	

ART UNIT	PAPER NUMBER
1765	

DATE MAILED: 10/25/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/719,083	HWANG ET AL.	
	Examiner	Art Unit	
	Patricia A. George	1765	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *07 August 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,2,4,6-9 and 11-13* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☐ Claim(s) _____ is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☒ Other: _____.

Continued Examination

Applicant's request for reconsideration of the finality of the rejection of the last Office action, during the phone interview of 08/01/2006 is persuasive in regards to Meador et al. does not teach forming the gas protection film comprising a water-soluble polymer material on the photoresist film and the gas protection film absorbing silicon gas generated from the photoresist film during an exposure process, therefore, the finality of that action is withdrawn.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 6 and 9 rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claims 6 and 8 use punctuation such as parenthesis and forward slashes to denote polymers comprised in a film (evidenced by applicants' remarks, on page 8). Forward slashes are typically used, in technical writing, to denote the term - - - or - - -, not "and" as applicants indicate (see page 2, Guidelines On Styles For Technical Writing, Will Hopkins PhD, University Otago, Dunedin, New Zealand). For the sake of examination, the punctuation will be defined as applicants, on page 8. However, as applicants have used said punctuation in a non-standard format, the claim as read by one skilled in the art, is clearly indefinite.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.
>
> This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 1, 4, 6-9, and 12-13 are rejected under 35 U.S.C. 103(a) over Meador et al. (193-nm Multilayer Imaging Systems; Proc. SPIE Vol. 5039, June 2003, Advances in Resist Technology and Processing XX; Theodore H. Fedynyshyn; Ed.) in view of Takano et al. (6,692,892), evidenced by Wolf (Silicon Processing for the VLSI Era; pg. 408; lattice Press; 1986); and Barclay et al., "Bilayer Technology for ArF and F_2 Lithography: The Development of Resists to Minimize Silicon Outgassing" Proc. SPIE, 2003, Vol. 5039, p. 453.

Meador et al. teaches a method of forming multiple layers of photoresist to pattern a structure using a photolithography process. See Figure 1, where Meador et al. illustrates a coating of BARC layer (i.e. the etching mask layer) is patterned and used for masking the area of the substrate undesirable to etch in the final CF4 etch into the substrate. Meador et al. also teaches the patterned BARC serves as the etching mask during the transfer of the image to the substrate in section 1. Introduction. This illustration is written on coating an etching masking layer on an underlying layer, as in

applicants' step a). Meador et al. illustrates coating, onto the etching mask layer, an EML material (refered to as M. layer in Figure 1). Because Meador et al teaches a plurality of EML's for the sake of this examination, examiner will select use of EML VI. As to the composition of the EML VI Meador et al. teaches: 11.1 wt % of silicon is included in the polymer (see Table 1, and the first sentence of section 3.1.1.); and 9 parts of photoresist (see section 3.1.3). Wolf provides evidence that the function of photoresist is well established and perform two roles: first it must response to exposing radiation such a way that a mask image can be replicated in the resist; and second the remaining areas of resist must protect the underlying substrate during subsequent processing.

It would have been obvious to one of ordinary skill in the art at the time of invention was made, EML VI, is Meador et al.'s, is a photoresist film, as in applicants' limitation b), because in composition it is 9 parts photoresist, and therefore has the capability to provide the two functional roles of photoresist, as identified by Wolf.

As to said silicon-containing polymers generate an silicon containing gas upon exposure to light in the reference of Meador et al. Meador et al. clearly teaches use of silicon-containing polymers in EML VI. Meador et al. also teaches the top layer of photoresist, as illustrated in Figure 1, is not required (see section I. Introduction).

Meador et al. fails to teach the intrinsic property silicon-containing polymers generate a silicon containing gas upon exposure to light.

It would have been obvious to one of ordinary skill in the art at the time of invention was made, that silicon-containing polymers generate a silicon containing gas upon exposure to light because the reference of Meador et al. teaches exposing the same material, using the same type light, therefore it would appear that the same effect would intrinsically generating a silicon gas upon exposure to light.

The intrinsic property exposure silicon-containing polymers generate a silicon containing gas is observed through the formation of SiO2 on stepper parts and evidenced by Barclay et al., "Bilayer Technology for ArF and F_2 Lithography: The Development of Resists to Minimize Silicon Outgassing" Proc. SPIE, 2003, Vol. 5039, p. 453).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention was made, when using Meador et al.'s EML VI as a top layer of photoresist, exposure to the light source generates an silicon containing gas upon exposure to light, because it has been well established that silicon containing polymers, as EML VI, generate a silicon containing gas upon exposure to light, as applicant's claimed limitation.

Meador et al. teaches forming an underlayer pattern by using the etch mask pattern which was formed by etching with the photoresist film pattern (see fig. 1).

Meador et al. does not teach forming the gas protection film comprising a water-soluble polymer material on the photoresist film and the gas protection film absorbing

silicon gas generated from the photoresist film during an exposure process as in claims 1 and 9; or the steps of spin coating said material on the resultant surface followed by baking the said composition, as in claim 13.

Takano et al. teaches use of an ARC that provides excellent profile even when an anti-reflective coating is formed by spin coating (col. 3, line 45) on a resist material (i.e. resultant surface), and baked (see example 1). Takano et al. teach the water soluble ARC film comprise polyvinyl pyrrolidone, as in claims 6 and 9 (see abstract and col.2, line 48).

Since the reference of Takano et al. teaches using the same material, water-soluble ARC film comprise polyvinyl pyrrolidone, in the same configuration, over a resist material, it would appear that the same effect, absorbing silicon containing gas generated by the photoresist (as in claim 1) would intrinsically be produced (see references noted in Conclusion under prior art made of record and not relied upon).

It would have been obvious to one of ordinary skill in the art at the time of invention was made, to include the step of using a gas protection film comprising a water-soluble ARC film comprising polyvinyl pyrrolidone on the photoresist film, as Takano et al., when forming the photoresist pattern, as Meador, because Takano teaches use of the material provides excellent profile even when an formed by coating on a resist.

As for claims 4, 7, and 12 Meador et al. anticipated the photo resist composition is for a process employing a light source of 193-nm Imaging Systems (ti.).

As for claim 8, Meador et al. anticipated spin coating and hot plate baking the coated compositions (ab. l.3).

Claim Rejections - 35 USC § 103

Claims 2 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Meador et al. and Takano et al., as applied to claims 1, 4, and 6-9 (see discussion above) in view of Shibata et al. of Material and Process Development of Tri-level Resist System in KrF and ArF Lithography [Proc. SPIE Vol. 4690, July 2002, Advances in Resist Technology and Processing XIX; Theodore H. Fedynyshyn; Ed.].

Meador et al. fails to teach the tri-level etching mask layers are formed by use of KrF photo resists, as in claims 2 and 11.

As for claims 2 and 11, Shibata et al. teaches the tri-level etching mask layers are formed by spin coating a KrF photo resist layer system (ab., l.7-8).

It would have been obvious to one of ordinary skill in the art at the time of invention was made, to include the use of KrF resists, as taught by Shibata, when forming the tri-level resist system of, Meador, because Shibata teaches the KrF tri-level system provides greater excellent dry etch resistance because of the high carbon (90%) content (see abstract).

Response to Arguments

Applicants' argue, on page 6, that Meador does not disclose a gas protectant film formed on a photo resist layer. Examiner agree and offer new grounds for rejection above.

As to applicants' argument, on page 8, toward the use of the copolymers of claims 6 and 8, please read response above.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure:

Relevant to host polymer polyvinylpyrrolidone absorbing vapors: Samoc et al. "PHOTOPHYSICAL PROCESSES INVOLVED IN CREATION OF DARK SPATIAL SOLITONS IN COMPOSITE PHOTONIC MEDIA", Laser Physics Centre, Australian National University, Canberra, ACT 0200, Au, 1993; 5420197; 6306439

J. Meute of IBM "157nm Stepper Optics Lifetime Field Experience" presentation at Semitech - Dec. 2001; Kishkovich et al. "Prevention of Optics and Resist Contamination in 300nm Lithography: Improvements in Chemical Air Filtration," in *Proceedings of Metrology, Inspection, and Process Control for Microlithography XV* (Bellingham, WA: SPIE, 2001), 739–752; Kishkovich et al., "Real-Time Methodologies for Monitoring Airborne Molecular Contamination in Modern DUV Photolithography Facilities," in *Proceedings of Metrology, Inspection, and Process Control for Microlithography XIII* (Bellingham, WA: SPIE, 2001), 348–376.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Patricia A. George whose telephone number is (571)272-5955. The examiner can normally be reached on weekdays between 7:00am and 4:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine Norton can be reached on (571)272-1465. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Patricia A George
Examiner
Art Unit 1765

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0906

NADINE NORTON
SUPERVISORY PATENT
EXAMINER
ART UNIT 1765